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HEADQUARTERS
SPACE SYSTEMS DIVISION (AFSC)
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

DCLPS

10 January 1962

MILITARY SATELLITE PROGRAMS PROGRESS REPORT
Month Ending 31 December 1961
AF-D28

FOREWORD

Attached are the reports covering progress during the month of December 1961 for the DISCOVERER and MIDAS Programs. These reports are directed by Secretary of Defense memorandum to the Secretary of the Air Force dated 27 February 1960.

Per William B. Ritland
O. J. RITLAND
Major General, USAF
Commander

2 Atch
1. ~~(C)~~ DISCOVERER Program
2. ~~(S)~~ MIDAS Program

DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

CLASSIFICATION OF THIS DOCUMENT WILL BE DOWNGRADED TO Unclassified UPON REMOVAL OF ENCLOSURES

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DISCOVERER PROGRAM

1. This report, covering progress during the month of December 1961, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. FLIGHT TEST STATUS

a. DISCOVERER 36 Flight

(1) DISCOVERER 36 was launched from Complex 75-3, Pad 4, Vandenberg Air Force Base at 1240 PST on 12 December. All events occurred as programmed and a near perfect orbit was attained. Only one hold occurred during the countdown; the presence of a train in the area delayed the launch for seventy minutes. Satellite orbital parameters are given in Table I. (C)

Event	Programmed	Actual
Apogee, nautical miles	223.0	271.0
Perigee, nautical miles	130.0	133.0
Period, minutes	91.0	91.77
Eccentricity	.013	.0189

TABLE I. DISCOVERER 36 PROGRAMMED AND ACTUAL ORBITAL PARAMETERS

(2) Recovery was initiated on the 64th pass. The capsule was ejected, re-entered the atmosphere approximately as predicted, and was sighted by the JC-130 recovery aircraft shortly before impact in the ocean. The aerial recovery force marked the impact area with flares and a team of three Air Force pararescue men jumped into the Pacific to recover the capsule. This represented achievement of a new milestone for extended orbital operation prior to recovery (four days on orbit). (C)

(3) An ample supply of control gas remained throughout the flight; the pneumatic tanks in the satellite registered 900 psi during the 105th pass. Although link 2 telemetry ceased functioning on the ninth pass, the primary electrical bus registered 23 volts through the 105th pass. This is sufficient power for continued operation of telemetry and beacon equipment. (C)

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b. DISCOVERER 36 Experiments

DISCOVERER 36 carried several experiments of international interest. These experiments and special progress utilized the increased AGENA weight carrying capability and included the following:

(1) The University of Illinois experiment to study the effect of the ionospheric-tropospheric layers of radio transmission. This experiment will assist in determining the southern boundry of an ionospheric disturbance which causes attenuation of r-f signals of satellites in the northern hemisphere. A 20 and 40 megacycle radio transmitter (mounted on the satellite) transmitted a continuous, unmodulated signal which was recorded by ground stations throughout the world. The results are currently being analyzed. (U)

(2) The Sequential Collation of Range (SECOR) transponder system for measurement of distances between points (radio transmitters) on earth was also carried. The transponder was interrogated and the results recorded following pass eight. This experiment was conducted in cooperation with the U. S. Army Signal Corps, and is part of a program to more accurately determine the distances between points on the earth's surface for precision mapping. (U)

(3) DISCOVERER 36 also carried a VELA HOTEL payload. This was the fourth consecutive successful launch in a planned six-shot sequence. The last two payloads are tentatively shceduled for late in 1962. These instruments, furnished by Lawrence Radiation Laboratories, include x-ray detectors, solid state spectrometers, neutron-gamma detectors, and a 180 minute capacity tape recorder which when interrogated will readout its entire tape in five minutes. These experiments will provide a basis for detection of nuclear explosions in space. (C)

(4) For the first time in the history of the space industry, a portion of a DISCOVERER satellite was used for a purely "civilian" project. By special arrangement with the Air Force, the radio amateurs of the world were permitted to design and fabricate a satellite to be carried aloft "piggyback" on DISCOVERER 36. OSCAR (Orbital Satellite Carrying Amateur Radio), a ten pound, battery-powered, 145 mc radio transmitter, was designed, constructed, and financed by interested amateurs and companies. When the AGENA satellite achieved orbit, OSCAR was ejected into its own orbit by a spring mechanism. A completely self-contained modular package, OSCAR's battery is expected to permit the transmitter to broadcast the Morse code letters "H-I" (four dots followed by two dots) for approximately three weeks... (U)

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3. SIGNIFICANT DISCOVERER PROGRAM ACHIEVEMENTS FOR 1961

a. First time in the free world that satellites were successfully placed into orbit on successive days (DISCOVERER 20 and 21). These two launches demonstrated a considerable advance in DISCOVERER launch and orbit operations capability. (U)

b. The replacement of C-119 recovery aircraft by JC-130B turbo-prop planes. The JC-130's are faster, have longer range, and can be used to recover heavier capsules. (C)

c. The change over to the Bell Telephone Laboratories (BTL) guidance system was accomplished during 1961. Results indicate that performance of the BTL Series 400 guidance system, developed for TITAN II, has been excellent. (C)

d. The first restart of an AGENA vehicle on orbit was accomplished this year. This restart was a significant step in the program to provide in-space maneuverability to the AGENA. (C)

e. Vandenberg Air Force Base Complex 75-1, Pad 1, was converted from a THOR IREM stand to a DISCOVERER launch facility. Complex 75-3, Pads 4 and 5, were modified to include new propellant transfer systems and new launch control equipment. These changes alleviated the previous launch problems by reducing countdown time and increasing reliability. (C)

f. The successful recovery of a capsule after four days on orbit. Optimum performance by all satellite-borne components and ground support station equipment make this major milestone possible. (U)

4. COMPARISON OF THREE YEARS DISCOVERER FLIGHTS

The following table permits a comparison of the success in achieving orbit and recovering capsules from DISCOVERER satellites for the three year existence of the program:

	1959	1960	1961
Number Launched	9	11	17
Number/Percentage Attaining Orbit	6/67%	7/64%	12/71%
Number/Percentage Recovered	0/0%	4/67%*	7/64%*
By Air	0	3	4
By Sea	0	1	3

* On one flight recovery was not an objective. (C)

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MIDAS PROGRAM

1. This report, covering progress during the month of December 1961, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. PROGRAM ADMINISTRATION

During the last week of November, the Space Systems Division directed Lockheed to proceed with development of an initial (Series IV) MIDAS system based on random rather than controlled orbits. This change permits the use of a simplified MIDAS vehicle with the resultant probability of increased reliability. The program was also reoriented to the use of the AGENA D (standard AGENA) for future flights (Series IV and subsequent). At the time of the reorientation, manufacturing had not begun on this series of vehicles although considerable design work had been completed. Authority was reaffirmed to proceed with initial efforts in the development of an advanced payload capable of detecting low thrust, short burn, solid propellant type missiles. (S)

3. TECHNICAL PROGRESS

a. Second Stage Vehicles

(1) MIDAS V (AGENA 1203) is at the Vandenberg Air Force Base missile assembly building where it will undergo a systems check beginning on 22 January 1962. On the present schedule, the vehicle will move to Point Arguello Launch Complex 1, Pad 2, on 22 February 1962 for a launch during the last week in March 1962. Checkout of the MIDAS V payload (last Baird-Atomic Series II payload) was completed at Lockheed, Sunnyvale, and the payload was shipped to Vandenberg Air Force Base on 27 December. (C)

(2) A project West Ford experiment, which was flown on MIDAS IV, will be repeated on MIDAS V. This 90-pound "piggyback" payload will be ejected from the MIDAS satellite on orbit and will distribute several hundred million tiny copper dipoles in a band around the earth. This is a Lincoln Laboratory experiment in propagation of short wave radio signals. (S)

(3) MIDAS VI (AGENA 1204) is currently undergoing telemetry checks and clean-up modifications in the systems test area. It is scheduled for installation in Complex 1A on 19 February for integrated systems testing. The vehicle will be transferred to Santa Cruz Test Base in late April and hot firings will begin on 19 June. The payload for this vehicle, the first Aerojet-General Series III payload, was received at Lockheed, Sunnyvale, on 21 December. It is scheduled for compatibility tests prior to checkout in the Subsystem G (infrared payload) laboratory. (C)

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b. Reliability Program

(1) The MIDAS Reliability Program is divided into seven elements: Program Direction and Special Studies, Materials Research and Application, Parts Application and Evaluation, Subsystems Reliability, Product Analyses, Systems Life Tests, and Education and Training. (U)

(2) Materials Research and Application - The objective of this element is to determine the effect of the space environment on MIDAS equipment. This is accomplished by literature searches into the area of investigation, environmental test programs on basic materials and selected mechanisms, and development of new materials, techniques or processes. Investigations are being conducted in the following areas with significant results as indicated:

(a) Thermal Control Paints and Finishes - Tests of the silicate thermal control paint to be used on the MIDAS Series II payload radiator has indicated that it is superior to any other tested for this purpose. This paint was developed through the MIDAS reliability materials research and application program and is a major step toward achieving a one year orbital working life for MIDAS. ~~(S)~~

(b) Lubrication of Mechanisms - Operation time on lubricated bearings in a simulated space environment has now exceeded 9,500 hours. The tests were conducted under 1×10^{-6} pounds per square inch vacuum conditions and have involved 16 different lubricants, three different methods of application, and seven different types of ball bearings. (U)

(c) Electrical Contacts in Space Environment - Tests for noise in sliding contacts has shown that when molybdenum disulphide (MoS_2) is used as a surface boundry lubricant, electrical noise is greatly reduced under vacuum conditions. Tests of simulated applications are continuing. ~~(S)~~

(d) Infrared Detectors and Optical Filters - Present test data has failed to show any detector cell types to be preferable for performance characteristics under MIDAS environments. Tests of optical material does, however, indicate that cerium-protected glass, sapphire, and Corning fused silica are capable of resisting radiation-induced coloration. (U)

(3) Parts Application and Evaluation - This element consists of a continuing program of upgrading procurement specifications to take advantage of new technological advances. High reliability procurement specifications are being prepared and implemented as rapidly as possible to insure obtaining components that represent the highest state-of-the-art at the present time. To date, eleven of 29 high-reliability

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specifications have been completed for various high density parts. A program is being implemented for packaging and handling these high-reliability items to protect them during shipment and stocking. This program is keeping ahead of the procurement program to insure adequate protection of the components during handling. Steps are also being taken to make manufacturing process specifications enforceable by Quality Assurance. This will insure that high-reliability processes are properly carried out. Since each testing operation increases the possibility of component damage and since it is virtually impossible to measure the "high-reliability" required, it is anticipated that Quality Assurance will do more monitoring of processes than testing for compliance after completion of assembly. Quality cannot be checked into a product. (U)

c. HIVOS Chamber Acceptance Tests Begin

(1) The High Vacuum Orbital Simulator (HIVOS) at Lockheed, Sunnyvale, is nearly completed and acceptance tests have begun. Acceptance tests of the HIVOS special equipment, including the low speed data system and automatic programming and test system, are complete. Following acceptance of HIVOS, test vehicle and facility compatibility will be checked. Then a series of compatibility and life tests of the MIDAS system under simulated orbital conditions will be initiated. These tests are expected to continue into mid-1963. The test specimen will be a MIDAS orbital vehicle shortened to fit the test chamber. Thermal simulation will be used to compensate for the shorter length and the ascent equipment not needed for the test. A Series III payload will be used during the tests. (U)

(2) The HIVOS chamber is simular to the High Altitude Test Simulator (HATS) chamber which is also located at Lockheed, Sunnyvale. The HATS chamber has been used extensively for component orbital simulation tests. The HIVOS, however, can accommodate a larger specimen and can produce a harder vacuum. In addition, heat flux and solar shadow conditions expected on orbit can be accurately simulated and automatically programmed in the HIVOS. (U)

d. Facilities

(1) All construction at Point Arguello Launch Complex No. 2 is progressing satisfactorily with overall completion estimated at 28%. The Technical Support Building structure is essentially finished, with interior finishing work continuing. Concrete for the Launch Operations Building roof deck and supporting columns has been placed. The No. 3 Launch Stand and Service Building roof slab forming is proceeding and concrete was placed for the track beams between the missile service tower footings on 15 December. Concrete for No. 4 Launch Stand and

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Service Building columns and walls and for the missile service tower footings has been placed. Forming and placing of steel continues in the general area. The sewage treatment plant has been installed and backfilled. The base course has been laid for the parking lot and portions of the main road into the complex. (U)

(2) Modification work on 18 of the 20 buildings in the second increment of the Vandenberg Air Force Base Technical Support Building package which was started on 7 August is approximately 80% complete. Construction completion is scheduled for January 1962. The remaining portion of the second increment package will be awarded if FY 62 funds are made available. (U)

(3) A construction contract has been awarded and work has begun on additions and modifications to the Vandenberg Tracking and Telemetry Station Data Acquisition and Processing Building. Modifications to the existing air conditioning system are to be prepared as a separate bid package which should be ready for contract action in about one month. (U)

(4) The Control and Identification Building for the New Boston Tracking and Telemetry Station has been released for design and construction to the New England Division Corps of Engineers. Construction of the Technical Support Building is scheduled for completion in March 1962. (U)

(5) A design backcheck review of the final plans and specifications for the first increment of the support facilities at the Ottumwa, Iowa, Tracking and Control Center is scheduled for 5 January 1962. Design of the technical facilities is complete but advertising for construction is deferred pending release of funds. (U)

(6) Modifications to technical room areas at the Donnelly Flats, Alaska, tracking station have been completed. Installation of supplementary air conditioning is scheduled for completion on 15 February 1962. The barge which was carrying the air conditioning equipment became icebound and caused a delay in completion. (U)

(7) Design of the [redacted] facilities is continuing. (U)

(8) Final design review of the administrative addition to the Satellite Test Annex, Sunnyvale, California, was held on 21 December. Backcheck review for correction of discrepancies during final review is scheduled for 8 January 1962. (U)

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HEADQUARTERS
SPACE SYSTEMS DIVISION (AFSC)
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

DCLPS 11 December 1961

MILITARY SATELLITE PROGRAMS PROGRESS REPORT
Month Ending 30 November 1961
AF-D28

FOREWORD

Attached are the reports covering progress during the month of November 1961 for the DISCOVERER and MIDAS Programs. These reports are directed by Secretary of Defense memorandum to the Secretary of the Air Force dated 27 February 1960.

for O. J. RITLAND
Major General, USAF
Commander

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1. (C) DISCOVERER Program
2. (S) MIDAS Program

CLASSIFICATION OF THIS DOCUMENT WILL BE DOWN GRADED TO [redacted] UPON REMOVAL OF ENCLOSURES

DOWNGRADED AT 12 YEAR INTERVALS; NOT AUTOMATICALLY DECLASSIFIED. DOD DIR 5200.10

DCLPS-21

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DISCOVERER PROGRAM

1. This report, covering progress during the month of November 1961, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. FLIGHT TEST STATUS

a. DISCOVERER XXXIV Flight

(1) DISCOVERER XXXIV was launched from Complex 75-1, Pad 1, Vandenberg Air Force Base, on 5 November. A launch attempt on 1 November was aborted due to a DM-21 malfunction. The launch and flight occurred as programmed through AGENA engine ignition. AGENA engine cutoff did not occur as planned and the engine continued to burn until propellant depletion occurred, resulting in a highly elliptical orbit. The orbit resulted in an abnormal control gas expenditure rate. This rate would have made a recovery after one days operation necessary. However, a malfunction of a control gas valve between orbits 8 and 9 depleted the remaining supply. Depletion of control gas prevented attempting capsule recovery. The gas valve malfunction has not yet been diagnosed. ~~(C)~~

(2) Investigations have shown that the failure of the AGENA engine to shutdown when the correct velocity was reached resulted from unusually high performance by the AGENA engine. This increased performance permitted the vehicle to achieve the correct orbital velocity prior to the disabling of the AGENA vehicle safety switch and prevented the accelerometer signal for the engine shutdown from being received. The safety switch is activated by a preset timing device and prevents premature shutdown should the accelerometer run away and attempt to shutdown the engine prior to attaining minimum orbital velocity. ~~(C)~~

b. DISCOVERER XXXV Flight

(1) The DISCOVERER XXXV launch was postponed to 15 November because of a DM-21 guidance package malfunction. Launch occurred from Complex 75-3, Pad 4, Vandenberg Air Force Base, at 1322 PST on 15 November. The orbit was confirmed by the Kodiak tracking station at 1447 PST. Satellite orbital parameters are given in Table I. (U)

Event	Programmed	Actual
Apogee, statute miles	258.0	190.1
Perigee, statute miles	150.0	156.7
Period, minutes	91.0	89.84
Eccentricity	0.013	0.0043

TABLE I. DISCOVERER XXXV PROGRAMMED AND ACTUAL ORBITAL PARAMETERS

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(2) Based on satellite operation, the decision was made to recover the capsule on the 18th pass. Capsule re-entry occurred close to Tern Island, the predicted impact area. The descending capsule was sighted by the crew of the C-130 aircraft at 18,000 feet and aerial recovery was accomplished on the first pass at 1644 PST on 16 November. The capsule was taken to Hickam Field and then flown to the mainland for disassembly and study. Following capsule ejection, the vehicle was stabilized and tracking operations continued for five days. Electrical power and control gas systems were functioning properly on the 77th pass. ~~(C)~~

(3) This recovery was the seventh successful air-recovery of a DISCOVERER satellite capsule (three others were recovered from the ocean) and the 24th DISCOVERER satellite vehicle to attain orbit. (U)

c. DISCOVERER XXXV Experiments

For the first time a Time History Canister (a device for measuring radiation as a function of time) was recovered from orbit. The canister provides an indication of the amount of radiation encountered at any given time on the orbital track. The DISCOVERER XXXV vehicle also carried an Air Force School of Aviation Medicine canister, a nuclear block to measure space particle characteristics and energy levels, and Geophysical Research Directorate devices. (U)

d. Future Flights

DISCOVERER XXXVI will carry several experiments of international interest. These experiments and special programs use the increased AGENA weight carrying capability and include the following:

(1) Orbital Satellite Carrying Amateur Radio (OSCAR) - A ten pound, 145 megacycle, radio transmitter will be carried aloft and ejected into its own orbit for use by radio amateurs throughout the world. The transmitter will broadcast in Morse code the letters "H-I" (four dots followed by two dots) to be monitored and tracked by interested observers during the lifetime of its self-contained batteries (approximately three weeks). The payload has been designed, constructed, and financed by interested amateurs and companies. (U)

(2) Sequential Collation of Range (SECOR) - SECOR is a transponder system which can be interrogated by ground stations and is used to measure accurately the distance between the various stations. The SECOR Program will permit precision mapping of the world and is being conducted in cooperation with the U.S. Army Signal Corps. (U)

(3) University of Illinois Experiment - Conducted under the direction of the University of Illinois, this experiment for investigating the composition of the Ionospheric-Tropospheric layers will be included in the DISCOVERER XXXVI payload. A small 20 and 40 megacycle

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transmitter will transmit a continuous, unmodulated signal; the signal will be recorded by stations throughout the world and the results analyzed. (U)

(4) GRD and V-H Experiments - DISCOVERER XXXVI will carry two [illegible]ophysical Research Directorate cosmic ray monitors, and an r-f impe-[illegible]nce probe. A VELA HOTEL package for measuring neutron and x-ray radiation will also be carried. (U)

3. TECHNICAL PROGRESS

Extensive studies are underway at Lockheed Missiles and Space Company, Lear, and the Santa Cruz Test Base facilities to determine the cause of the hydraulic failure in the DISCOVERER XXXIII AGENA vehicle. These studies include component and system-level tests under simulated environmental and operational conditions, and review of flight and test data. Failures resulting in similar erratic engine control system operation also occurred on DISCOVERER XXII and DISCOVERER XXVIII flights. As a safety factor, the two AGENA vehicles launched during November were modified by derating the hydraulic pumps from 3500 to 3350 psig until further studies are completed and any redesign incorporated. ~~(G)~~

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MIDAS PROGRAM

1. This report, covering progress during the month of November 1961, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. PROGRAM ADMINISTRATION

a. In view of anticipated funding limitations and possible program directive restrictions, an extensive and exhaustive study of objectives vs capabilities under various programming parameters is being conducted. This study is being accomplished with the concurrent coordination and/or participation of the prime contractor, AFSSD, AFLC, SAC, ADC, and representatives from AFSC and the Hq USAF Systems Staff Office. The results, conclusions, and recommendations of this comprehensive planning effort are scheduled to be presented to the Air Council prior to the Christmas holidays. ~~(S)~~

b. The MIDAS IV Payload Data Analysis and Evaluation Report will be distributed on 8 December. (U)

3. FLIGHT TEST STATUS

Launched on 21 October, the MIDAS IV telemetry channels provided a large quantity of high quality data throughout its active lifetime. Analysis of the data received from the satellite was continued during November. Particular emphasis was placed on establishing the satellite's motion on orbit and on determining whether IR signals were detected from either the DISCOVERER or the TITAN vehicles launched during its active life. Thorough analysis of the infrared detection payload data and other telemetry data has permitted analysis of the satellite motion with sufficient accuracy to predict the scan area of the payload at any moment during its active life. Based on this analysis, it was determined that the DM-21 boosted DISCOVERER XXXIII vehicle, launched from Vandenberg Air Force Base on 23 October, was never within the field of view of the MIDAS IV scanner. TITAN J21, which was launched from the Atlantic Missile Range on 24 October, was momentarily within the scan area forty seconds after launch (approximately 12,000 feet). This is considerably below the altitude at which the MIDAS payload is expected to detect an intercontinental ballistic missile launch. ~~(S)~~

4. TECHNICAL PROGRESS

a. Second Stage Vehicles

(1) Because of limited launch stand availability and launch capabilities, and the higher priority of other programs the MIDAS V vehicle was removed from the launch schedule late in October. The MIDAS V AGENA satellite vehicle was returned to the Lockheed Sunnyvale facility

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from Vandenberg Air Force Base on 23 October for storage. On 23 November the satellite was returned to Vandenberg Air Force Base to prepare for possible launch in December. It is currently undergoing systems checks in the missile assembly building, with transfer to Point Arguello launch stand scheduled for 1 December. ~~(S)~~

(2) The MIDAS VI satellite vehicle completed guidance and control (subsystem D) checks in the systems test area and was sent to manufacturing for necessary modifications on 27 November. It is scheduled to be returned to systems test on 14 December. (U)

b. Infrared Scanners

Two Aerojet-General Corporation payloads, one for MIDAS VI and one HIVOS life test are scheduled for delivery to Lockheed Missiles and Space Company in mid-December. The third unit, the MIDAS VII payload, is scheduled for delivery late in January 1962. ~~(C)~~

c. Facilities

(1) All construction at Point Arguello Launch Complex No. 2 is progressing satisfactorily with completion estimated at 18%. The Technical Support Building structure is essentially finished, with interior utility work in process. The Launch Operations Building ground floor and areaway slabs have been poured. The No. 2 Launch Stand and Service Building walls have been poured and the placing of girders at the launch stand and steel for the service building deck is in progress. The No. 4 Launch Stand and Service Building columns and walls have been poured. Cable tunnels are more than half erected, with some imbedded conduit already placed. (U)

(2) Modification of the Point Arguello Launch Stand No. 1 bridge crane has been completed, but the remaining modifications to Launch Stands No. 1 and No. 2 have been delayed pending stand availability and the release of FY 62 Military Construction Program funds. Construction of the Vehicle Support Building is proceeding on schedule, with completion scheduled for 15 February 1962. (U)

(3) Modification work on 18 of the 20 buildings in the second increment of the Vandenberg Air Force Base Technical Support Building package is approximately 60% complete, with construction completion scheduled for January 1962. The remaining portion of the second increment package will be awarded if FY 62 funds are released. (U)

(4) A construction contract has been awarded and work has begun on the additions and modifications to the Vandenberg Tracking and Telemetry Station Data Acquisition and Processing Building and associated warehouse. Modifications to the existing air conditioning system are being advertised as a separate bid package. (U)

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(5) Approval has been received for the design and construction of a Pass and Identification Building for the New Boston Tracking and Telemetry Station. Construction of the Technical Support Building is scheduled for completion in March 1962. (U)

(6) A recheck for correction of discrepancies discovered during review of the final plans and specifications for the first increment of the support facilities at the Ottumwa, Iowa, Tracking and Control Center is scheduled for 11 December. (U)

(7) Design of the administrative addition to the Satellite Test Annex, Sunnyvale, California, is continuing. The preliminary design review was held on 17 November. Only minor discrepancies were discovered; no major effort will be required for correction. Final design is now in progress. (U)

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HEADQUARTERS
SPACE SYSTEMS DIVISION (AFSC)
UNITED STATES AIR FORCE
Air Force Unit Post Office
Los Angeles 45, California

DCLPS

13 November 1961

MILITARY SATELLITE PROGRAMS PROGRESS REPORT
Month Ending 31 October 1961
AF-D28

FOREWORD

Attached are the reports covering progress during the month of October 1961 for the DISCOVERER AND MIDAS Programs. These reports are directed by Secretary of Defense memorandum to the Secretary of the Air Force dated 27 February 1960.

O. J. BUTLAND
Major General, USAF
Commander

2 Atch
1. ~~(C)~~ DISCOVERER Program
2. ~~(S)~~ MIDAS Program

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DISCOVERER PROGRAM

1. This report, covering progress during the month of October 1961, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. FLIGHT TEST STATUS

a. DISCOVERER XXXII Flight

(1) DISCOVERER XXXII was launched from Complex 75-3, Pac 4, at Vandenberg Air Force Base at 1053 PST on 13 October. All events during launch, boost, separation, coast, AGENA burn, and orbital injection occurred as planned. The orbit attained was almost exactly as programmed as shown in Table I. (U)

Event	Programmed	Actual
Apogee, statute miles	259.02	251.15
Perigee, statute miles	146.20	144.01
Period, minutes	91.0	90.85
Eccentricity	0.0135	0.0128

TABLE I. PROGRAMMED AND ACTUAL ORBITAL PARAMETER FOR DISCOVERER XXXII.

(2) Based on satellite operation, the decision was made to recover the capsule on the 18th pass. Capsule separation occurred at 1437 PST on 14 October over Alaska and re-entry occurred over the impact area near Hawaii. The descending capsule was located by radar and DISCOVERER direction finder equipment on board the aircraft and ships in the recovery force. The capsule was first sighted at 28,000 feet by the crew of one of the C-130 recovery aircraft. This aircraft snagged the parachute canopy on its second pass and reeled the capsule aboard. This was the second successive aerial recovery by a C-130 aircraft. Five of these planes have recently been assigned to the recovery force to replace the C-119's previously used. The C-130's are faster, have longer range, and can be used to recover the heavier capsules under development in other programs. (U)

b. DISCOVERER XXXII Experiments

(1) Samples of various materials were carried in and recovered with the DISCOVERER XXXII recovery capsule. These included solar cells, dosimetry packs, and a pack containing shielding material, nuclear blocks and metallic discs. These were returned to various Air Force organizations for analysis of space radiation effects. A cannister containing

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approximately 500 kernels of corn was also in the capsule and was returned to the Air Force. This corn will be planted to determine the mutations resulting from exposure to space radiation. (U)

(2) A University of Illinois experiment was conducted in an attempt to determine the southern boundary of an ionospheric disturbance which causes attenuation of RF signals from satellites in the northern hemisphere. A small 20 megacycle transmitter was mounted on DISCOVERER XXXII and it transmitted a continuous, unmodulated signal. Stations located throughout the world recorded the signal and the results are currently being analyzed. (U)

(3) In cooperation with the Army Signal Corps, a Sequential Collation of Range (SECOR) experiment package was carried aboard DISCOVERER XXXII. The package contains a transponder which can be interrogated from ground stations and is used as a means of determining the precise distances between the various stations. The SECOR program will permit precision mapping of the world. (U)

(4) DISCOVERER XXXII also carried Air Force Geophysical Research Directorate equipment consisting of an erosion detector, an electron density guage, and a charged particle energy analyzer. Data from these instruments were transmitted to ground stations by the DISCOVERER telemetry system and sent to the Geophysical Research Directorate for analysis. (U)

c. DISCOVERER XXXIII Flight

(1) DISCOVERER XXXIII was launched from Complex 75-3, Pad 5, at Vandenberg Air Force Base on 23 October. DM-21 boost, separation, coast, and AGENA ignition occurred as planned. However, operation of the hydraulic system which provides the motive power for engine gimbaling was erratic. The violent maneuvers of the satellite during this period resulted in disturbance of the gyro references and the satellite started on an extremely high trajectory. About 162 seconds after AGENA ignition, the hydraulic pressure dropped abruptly to zero and control of engine position was lost. Approximately ten seconds later, the XLR-81Ba-9 engine shut down. It is assumed that this premature cutoff resulted from the high acceleration forces imposed on the uncontrolled vehicle. The AGENA impacted in the south Pacific. ~~(C)~~

(2) Because of the hydraulic system difficulties on this and two previous flights (DISCOVERER XXVIII on 3 August and DISCOVERER XXII on 30 March), an extensive analysis and test program was started immediately. Hot firing tests at the Santa Cruz Test Base have been conducted and laboratory tests at both the Lockheed and Bell facilities were initiated. Areas of investigation include mechanical weakness, contamination in the hydraulic system, and contamination resulting from UDMH chemical action or foreign material in the UDMH (UDMH contamination could affect the hydraulic control system because the hydraulic pressure pump is driven by a hydraulic motor which gets its

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power from UDMH pressure and flow). Each system must be thoroughly rechecked before launch to be certain there is no contamination. No rescheduling will be necessary. (C)

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MIDAS PROGRAM

1. This report, covering progress during the month of October 1961, is submitted in accordance with Department of Defense memorandum to the Secretary of the Air Force, dated 27 February 1960.

2. PROGRAM ADMINISTRATION

a. The DDR&E special task group, established to evaluate MIDAS feasibility and capability, convened at Stanford Research Institute (SRI), Palo Alto, California on 25-28 October. Findings of the subcommittees, established during the initial session in late September, were reported and discussed preparatory to reporting the Task Group findings. (C)

b. Representatives from Space Systems Division (AFSSD) and Lockheed Missiles and Space Company (LMSC) met on 3 October to review overall plans and costs. The failure to make schedules, the slippages and associated increased costs make it impossible to meet all Fiscal Year 1962 program objectives. This necessitates an adjustment of phasing and scope of the MIDAS Program including a reduction in the effort to develop a nitrogen textroxide (N_2O_4) engine and secondary propulsion system (orbit adjust) for the AGENA satellite vehicle. Redirection of Aerojet-General and Baird-Atomic MIDAS Series III and IV payload development effort was accomplished during September to keep within budget allocations. (S)

c. The MIDAS III Payload Data Analysis and Evaluation Report was distributed on 15 October. This report describes the major payload elements used on the mission and their function. It also discusses the methods used in gathering and processing the readout data. An analysis and evaluation of payload performance and the data processed is presented. Included in the report are analyses of the payload thermal design and weather conditions while the satellite was on orbit. (U)

3. FLIGHT TEST STATUS

a. MIDAS III

(1) MIDAS III HEPDEX data have been reduced and a report issued on the proton flux levels experienced at the MIDAS orbital altitude. At 180 MEV the proton flux density is about equal to that predicted from other experimental data. However, at 60 MEV the proton flux density was one to two orders of magnitude above the predicted level. (U)

(2) Due to the erratic motion of the vehicle (MIDAS III) the solar panel data, although reduced showed time varying discrepancies and therefore is not conclusive. (S)

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b. MIDAS IV

(1) MIDAS IV, delayed because of an AGENA engine fuel pump seal drain line problem, was successfully launched from Point Arguello at 0553 PST on 21 October. Despite a loss of roll control during the ATLAS boost phase, the satellite vehicle was placed into a near circular 2000 nautical mile orbit. Table I shows the predicted and attained orbital parameters. (C)

Event	Programmed	Actual
Apogee, nautical miles	2100	2025
Perigee, nautical miles	2100	1898
Period, minutes	172.6	166
Eccentricity	0.00046	0.0125
Inclination, degrees	90.02	95.87

TABLE I. COMPARISON OF PROGRAMMED AND ACTUAL ORBITAL PARAMETERS FOR MIDAS IV

(2) Telemetry channels (e.g., status and performance of vehicle and payload, SAPUT, HEPDEX) provided considerable high quality data. Pertinent items that have been extracted from the data are as follows:

(a) Acquisition, tracking, and response to commands from the ground were near perfect. (U)

(b) During sustainer operation, the ATLAS booster rolled several times at a rate which reached a minimum of 72°/sec and was 44°/sec at AGENA separation. The total ATLAS/AGENA roll was 8.7 revolutions. The AGENA reduced the roll rate to zero after approximately one additional revolution. To accomplish this, twenty percent of the attitude control gas was expended. (C)

(c) Successful ejection of the West Ford package following AGENA second burn and continued operation of the High Energy Proton Density Experiment (HEPDEX) equipment has been confirmed by telemetry data. (U)

(d) All operating subsystems, including the solar power arrays and payload, functioned satisfactorily except that the control gasses were depleted on pass 1. On pass 34, one solar array turned away from the sun with the result that insufficient power was generated to maintain system operations beyond pass 54. (C)

(e) Analysis of the telemetry data shows:

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